

UNCLASSIFIED

AD 404 857

DEFENSE DOCUMENTATION CENTER

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA



UNCLASSIFIED

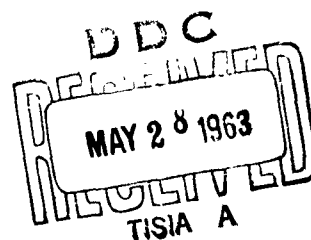
NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

CATALOGED BY ASTIA
AD NO. 404857

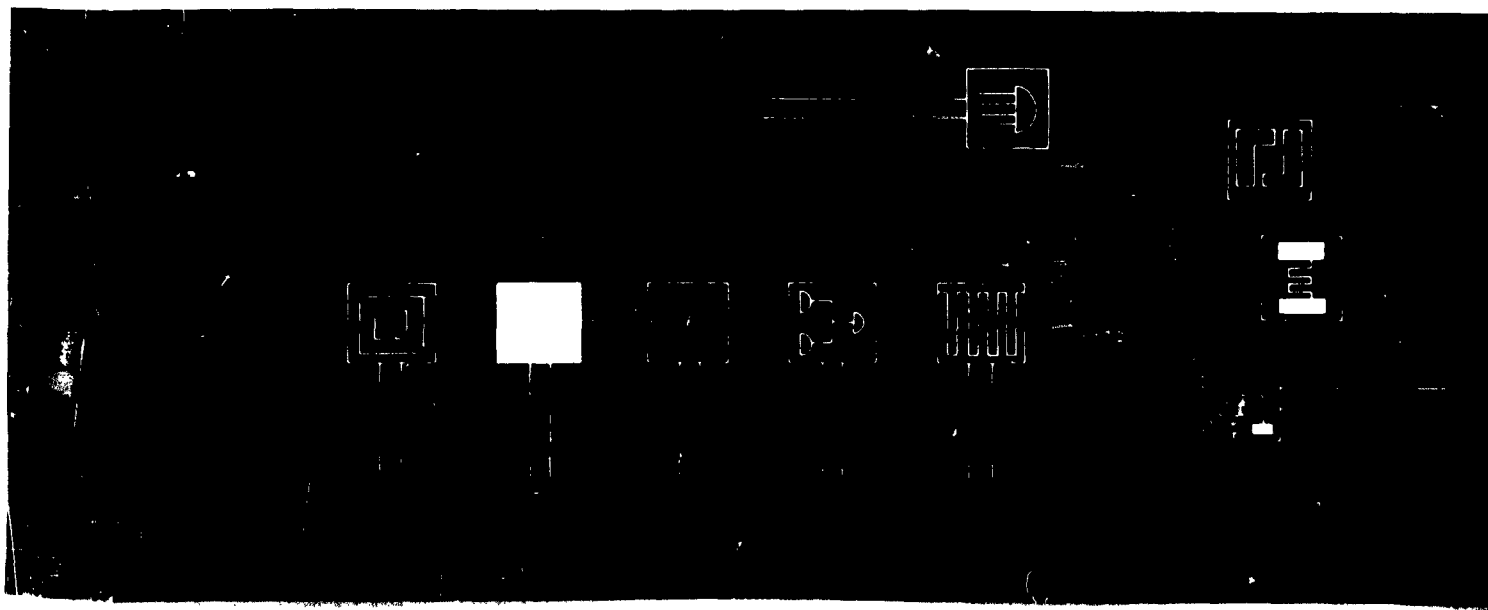
63 3 5

404 857

microminiature
circuitry glossary



Autonetics A DIVISION OF NORTH AMERICAN AVIATION INC



AUTONETICS
A DIVISION OF NORTH AMERICAN AVIATION, INC.

May 20, 1963



9150 E. IMPERIAL HWY.
DOWNEY, CALIFORNIA

IN REPLY REFER TO:

63AN/QRS-359

Armed Services Technical Information Agency
Arlington Hall Station
Arlington 12, Virginia

Subject: Submittal of publication

Gentlemen:

We are pleased to submit for distribution two (2) copies of Autonetics' publication "Microminiature Circuitry Glossary (pub 558-D-4) dated December 1962.

AUTONETICS

K. F. McQuade
K. F. McQuade
Chief, Reliability and
Engineering Systems


EHB:ml

microminiature circuitry glossary terms and definitions


December 1962

Prepared by
F. Iannone
Standards Unit

Approved By



F. E. Couch
Supervisor
Standards Unit



E. H. Schaefer
Director of Reliability and
Engineering Standards
Quality, Reliability and
Standards Division

Quality, Reliability, and Standards Division

AUTONETICS A DIVISION OF NORTH AMERICAN AVIATION, INC.



FOREWORD

This glossary is an initial compilation of the numerous terms and definitions in the field of microminiature circuitry.

Its purpose is to establish a common basis for communication and to eliminate the confusion resulting from the various interpretations in current usage.

Effort is being continued so that the scope of the contents may be expanded to reflect additional contributions from the many facets of microminiature circuitry.

Communications regarding this glossary should be forwarded to F. Iannone, Standards Unit, Dept 3024-42, Bldg 35, Autonetics, 1600 State College Boulevard. Anaheim, California

TERMS AND DEFINITIONS

ACTIVE ELEMENT - An element which displays transistance such as gain or control.

ACTIVE SUBSTRATE - A substrate for an integrated circuit in which a portion of the substrate displays transistance.

AMBIENT - The surrounding environmental conditions such as pressure or temperature.

ARRAY DEVICE - A multitude of similar, basic, complex, or integrated devices without separate enclosures, each having at least one of its electrodes connected to a common conductor or all connected in series.

ARTWORK - An accurately scaled configuration which is used to produce the master pattern.

ASSEMBLY - A number of parts or subassemblies or any combination thereof joined together to perform a specific function. (Examples: Audio frequency amplifier, vacuum tube voltmeter, distance meter, analog-to-digital converter.)

BASE - An insulating support for the printed pattern. It may consist of a flexible or rigid material.

BASIC DEVICE - The simplest useful device exhibiting a basic solid-state phenomenon.

BIONICS - The art which treats of electronic simulation of biological phenomena.

BLACK BOX - A term used loosely to refer to any subassembly or assembly, usually electronic, that can be readily inserted or removed from a specific place in a larger system by an operator not familiar with its detailed internal structure.

BOND STRENGTH - A measure of the stress required to separate a layer of material from the base to which it is bonded. It is measured in pounds per inch of width (peel strength) obtained by peeling the layer, and in pounds per square inch (pull strength) obtained by a perpendicular pull applied to a surface of the layer.

BOSS - Use TERMINAL AREA.

BREADBOARD MODEL - An assembly in rough form to prove the feasibility of a circuit, system, or principle.

BREAKDOWN VOLTAGE - The voltage at which an insulator or dielectric ruptures, or at which ionization and conduction take place in a gas or vapor.

CERAMIC - A product composed of inorganic, non-metallic compounds formed through heat processing.

CERAMIC-BASED MICROMINIATURE CIRCUITRY - A microminiature circuit printed on a ceramic substrate. Usually consists of combinations of resistive, capacitive, or conductive elements fired on a wafer-like piece of ceramic.

CHARACTERISTIC - Any dimensional, visual, functional, mechanical, electrical, chemical, physical, or material feature or property; and any process-control element which describes and establishes the design, fabrication, and operating requirements of an article.

CHEMICALLY REDUCED PRINTED CIRCUIT - A printed circuit formed by the chemical reduction of a metallic compound.

CHEMICALLY DEPOSITED PRINTED CIRCUIT - A printed circuit formed on a base by the reaction of chemicals.

CHIP - Use SUBSTRATE.

CIRCUIT - The interconnected combination of a number of elements or parts to accomplish a desired function. (Examples: Filter, oscillator, amplifier.)

CIRCUIT ELEMENT - A basic constituent of a circuit, exclusive of interconnections.

COLD WELD - The joining together of two metals (without an intermediate material) by the application of pressure only, without an electrical current or elevated temperature.

COMMON HARDWARE - Expendable hardware items having multiple application.

COMMON PART - A manufactured part which may be used commonly on two or more major items.

COMPONENT - Use appropriate term such as **ELEMENT**, **PART**, **SUBASSEMBLY**, **ASSEMBLY**, etc.

COMPONENT PARTS DENSITY - Use **PARTS DENSITY**.

CONDUCTIVE PATTERN - A design formed from an electrically conductive material on an insulating base.

CONDUCTOR - A single conductive line forming an electrical connection between terminal areas.

CONNECTOR - A part or constituent of a part. Its function is to provide separability of one circuit from another.

CONTROLLED PART - An item which requires the application of specialized manufacturing and procurement techniques.

CORDWOOD - The technique of producing modules by bundling parts as closely as possible and interconnecting them into circuits by welding or soldering leads together.

CRITICAL ITEM - An item whose failure could result in hazardous or unsafe conditions or prevent performance of the tactical function of the end item.

CROSSOVER - The point at which two conductors insulated from each other cross.

CURRENT-CARRYING CAPACITY - The maximum current which can be continuously carried without causing objectionable degradation of electrical or mechanical properties.

DEBUGGING - A conditioning procedure, involving the operation of equipment in specified environmental test conditions for the purpose of eliminating early failures by aging or stabilizing the equipment prior to final test and shipment.

DEFINITION - The fidelity of reproduction of pattern edges in the printed circuit relative to the original master pattern.

DEGRADATION - A gradual deterioration in performance. The synonym -- DRIFT is often used for electronic equipment.

DEPOSITION - The process of applying a material to a base by means of vacuum, electrical, chemical, screening, or vapor methods.

DEVICE - A combination of physical material to form a part comprised of one or more active elements. (Examples: Transistor, diode.)

DIP SOLDERING - A process whereby a printed wiring board or substrate is brought into contact with the surface of molten solder for the purpose of depositing solder onto the conductive surface or soldering parts to the printed wiring.

DRIFT - See DEGRADATION

DUTY CYCLE - A specified operating time of an equipment plus a specified time of nonoperation.

ELECTRON BEAM MACHINING - The process of using a controlled electron beam to weld or shape a piece of material.

ELECTRONIC INTERFERENCE - An electrical or electromagnetic disturbance that causes undesirable response in electronic equipment. Electrical interference refers specifically to interference caused by the operation of electrical apparatus that is not designed to radiate electromagnetic energy.

ELEMENT - An increment of volume of a part that displays an electrical phenomenon. (Examples: Transistor fabricated within a silicon substrate using diffused structures, resistor formed by fusing metal oxide onto a glass base, conductor screened on a ceramic substrate.)

EMISSION - The relative power (of a surface or a material composing a surface) to emit heat by radiation.

ENVELOPE DIAMETER - A dimension of an opening or hole, as in a tube or missile airframe, that describes the extent to which an object irregularly shaped can be accommodated as it rests in the opening or as it slides into the opening either at an angle or straight. The term is used especially in reference to accommodating electronic equipment within the airframe of a missile.

ENVIRONMENT - The aggregate of all conditions (such as temperature, humidity, radiation, magnetic and electric fields, shock, and vibration) which externally influence the performance of an item.

ETCHANT - A solution used, by chemical reaction, to remove the unwanted portion of a conductive material bonded to a base.

ETCHED WIRING SUBSTRATE - A printed conductive pattern formed by chemical, or chemical and electrolytic, removal of the unwanted portion of conductive material bonded to a base.

ETCHING - The process wherein unwanted metallic substance bonded to a base is removed by chemical, or chemical and electrolytic, means.

FABRICATION TOLERANCE - In the construction and assembly of an equipment or portion thereof, the maximum variation in the characteristics of a part which, when related to the defined variations of the other part comprising this equipment, will permit operation of the equipment within specified limits.

FEEDTHROUGH - Use **INTERFACIAL CONNECTION**.

FINGER - Use **PRINTED CONTACT**.

GRID - A two-dimensional network consisting of a set of equally spaced parallel lines superimposed upon another set of equally spaced parallel lines so that the lines of one set are perpendicular to the lines of the other, thereby forming square areas. The intersections of the lines provide the basis for an incremental location system.

GUARD BAND - The unused area which serves to isolate elements in a printed circuit. (Examples: Area between printed contacts, area between an element and the edge of the substrate.)

HEAT SINK - A contrivance for the absorption or transfer of heat away from a critical element or part.

INTEGRATED CIRCUITRY - A fabricated part which serves all or a portion of a function and which is constructed by etching, diffusing, doping, etc. of a single piece of material. Sections of this material may be joined by the use of jumper wires or printed circuitry.

INTERACTION - The effects from two or more elements, parts, assemblies, or equipments on each other where each is performing a function.

INTERCHANGEABILITY - The possession by two or more items of such functional and physical characteristics as to be equivalent in performance and durability and capable of being exchanged one for the other without alteration of the items themselves or of adjoining items except for adjustment, and without selection for fit or performance.

INTERFACE - The junction point or surface between two different media.

INTERFACIAL CONNECTION - A conductor which connects conductive patterns on opposite sides of the base.

INTERFERENCE PROTECTION - Those measures that shield or immunize sensitive areas of an equipment from electrical interference.

JUMPER - A direct electrical connection, which is not a portion of the conductive pattern, between two points in a printed circuit.

LAND - Use **TERMINAL AREA**.

MASK - An implement, usually a thin sheet of metal containing an open pattern, which shields selected portions of a base during a deposition process. Also, an implement used to shield selected portions of photosensitive material during photo processing.

MASTER DRAWING - A drawing showing the dimensional limits or grid location applicable to any or all parts of a printed circuit, including the base.

MASTER PATTERN - A 1-to-1 scale pattern which is used to produce the printed circuit within the accuracy specified in the master drawing.

MATRIX - Use **GRID**

MECHANIZED ASSEMBLY - The joining together of parts and/or subassemblies with the aid of operators and semiautomatic equipment.

MICROELECTRONICS - The art of electronic equipment design and its construction, which utilizes any of the microminiaturization schemes. This art of electronics deals with microminiature parts, subassemblies and assemblies.

MICROMINIATURIZATION - The technique of packaging a microminiature part or assembly composed of elements radically different in shape and form factor. Electronic parts are replaced by active and passive elements, through use of fabrication processes such as screening, vapor deposition, diffusion, and photoetching.

MICROMINIATURE CIRCUITRY - A circuitry fabricated in accordance with microminiaturization techniques.

MICROMINIATURE PART - A part fabricated in accordance with microminiaturization techniques.

MILITARY REQUIREMENT - The demand imposed upon the system to meet a military operational need.

MINIATURIZATION - The technique of packaging by reducing size and weight of electronic parts in step with the change from vacuum tubes to transistors and diodes.

MODIFICATION - The physical alteration of a system, subsystem, or equipment to change its designed capabilities or characteristics. Any change or correction in equipment structures, arrangement, or accessories affecting capabilities or characteristics.

MODULAR - The state of being composed of modules dimensioned in accordance with a set of prescribed size increments.

MODULE - A subassembly in a packaging scheme displaying regularity and separable repetition. May or may not be separable from other modules after initial assembly.

MOLECULAR ELECTRONICS - The science of the application of solid-state phenomena to perform electronic functions.

NEXT HIGHER ASSEMBLY - A term used to designate an assembly of the next higher level in the breakdown of a system.

OHMS PER SQUARE - The resistance of any square area, measured between parallel sides, of thin films of resistive materials.

PAD - Use **TERMINAL AREA**.

PART - One piece, or two or more pieces joined together which are not normally subject to disassembly without destruction of designed use.
(Examples: Composition resistor, transistor, screw, pulse transformer, gear, substrate or board with printed resistors or conductors.)

PARTS DENSITY - The number of parts per unit volume.

PASSIVE ELEMENT - An element exhibiting no gain or amplification.
(Examples: Resistor, capacitor.)

PASSIVE SUBSTRATE - A substrate which exhibits no effects of transistance.
(Examples: Glass, ceramic.)

PEEL STRENGTH - See definition for BOND STRENGTH.

PINHOLES - Small holes occurring as imperfections which penetrate entirely through the printed elements to the base. (Examples: Holes in screened resistors, thin film elements, screened epoxy masks.)

PITS - Small holes occurring as imperfections which do not penetrate entirely through the printed element.

PLANAR - Existing essentially in a single plane.

PRINTED CIRCUIT - A pattern comprising printed wiring and printed elements, all formed in a predetermined design in, or attached to, the surface of a substrate.

PRINTED-CIRCUIT ASSEMBLY - A printed circuit on which separately manufactured parts have been added. (Example: A ceramic substrate with screened conductors, screened resistors, screened inductors, and separate miniaturized capacitors.)

PRINTED CONTACT - That portion of a printed circuit used to connect the circuit to a plug-in receptacle and to perform the function of a pin in a male plug.

PRINTED ELEMENT - An element in printed form, such as a printed inductor, resistors, capacitor, or transmission line.

PRINTED WIRING - A portion of a printed circuit comprising a conductor pattern for the purpose of providing point-to-point electrical connection only.

(Examples: Screened conductive elements on a ceramic substrate; etched conductive lines on a printed-wiring board.)

PRINTED-WIRING BOARD - A completely processed conductor pattern, usually formed on a stiff flat base. It serves as a means of electrical interconnection and physical attachment for printed circuits.

PRINTED-WIRING SUBSTRATE - A conductor pattern printed on a substrate.

PRINTING - The act or art of reproducing a pattern on a surface by any of various processes, such as vapor deposition, photoetching, embossing, or diffusion.

PROCESS - Procedure or technique followed in the production of a product.

PROTOTYPE - A model suitable for use in complete evaluation of form, design, and performance.

PRODUCTION MODEL - A model in its final mechanical and electrical form of production design made by production tools, jigs, fixtures, and methods.

PULL STRENGTH - See definition for BOND STRENGTH.

REDUNDANCY - That design which makes additional electrical paths available to a function.

REGISTER MARK - A mark used to establish the relative position of one or more printed-wiring patterns or portions thereof, with respect to their desired locations on one or both sides of a printed-wiring base.

RESIST - A material such as ink, paint, metallic plating, etc., used to protect the desired portions of the printed conductive pattern from the action of the etchant, solder, or plating.

SEPARABLE PART - A replaceable part, the body of which is not chemically bonded to the base, excluding the effects of protective coatings, solder, and potting materials.

SHELF LIFE - The length of time an item can be stored under specified conditions and still meet specifications.

SOPHISTICATED - Complex and intricate utilization of advanced art; requiring special skills to operate.

SPECIFICATION - A detailed description of the characteristics of a product and of the criteria which must be used to determine whether the product is in conformity with the description.

STANDARDIZATION - The use of one item type to replace several.

STANDARDS - Documents that establish engineering and technical limitations and applications for items, materials, processes, methods, design, and engineering practices.

SUBASSEMBLY - Two or more parts which form a portion of an assembly or a unit replaceable as a whole, but having a part or parts which are individually replaceable. (Examples: IF strip, terminal board with mounted parts, resistance network screened on a substrate.)

SUBMINIATURIZATION - The technique of packaging miniaturized parts using unusual assembly techniques for increased volumetric efficiency. (Example: Cordwood.)

SUBSTRATE - A wafer-like piece of insulating material which may serve as a physical support or base and thermal sink for a printed pattern. (Examples: Ceramic, glass, silicon, quartz.)

SUBSYSTEM - An interconnected combination of a set of related circuits, or integrated circuits, to form a logical subdivision of an equipment or operational system.

TAB - Use PRINTED CONTACT.

TEMPERATURE COEFFICIENT OF CAPACITANCE - The amount of change in capacitance of any electronic part or element. Usually measured in parts per million per degree Celsius.

TEMPERATURE COEFFICIENT OF LINEAR EXPANSION - The amount of change in any linear dimension of a solid arising from a change in temperature. Usually measured in microinches per inch per degree Celsius.

TEMPERATURE COEFFICIENT OF RESISTIVITY - The percentage change in resistivity of any electronic part or element per degree change in temperature. Usually measured in percent per degree Celsius.

TERMINAL AREA - A portion of a printed circuit used for making electrical connections to the conductive pattern, such as the enlarged portion of a conductor.

TERMINAL PAD - Use **TERMINAL AREA**.

TEST EQUIPMENT - Equipment used to determine or measure functional or physical characteristics.

THERMOCOMPRESSION BONDING - The joining together of two materials without an intermediate material by the application of pressure and heat in the absence of an electrical current.

THIN FILM CIRCUIT - The combination on a single passive substrate, such as glass or ceramic, of a number of elements entirely in the form of deposited films of conducting, semiconducting, or insulating materials. The method and sequence of deposition, physical location, and shape of the film provide the interconnections on the common physical support. (Example: Vaporized tin oxide on glass.)

TOLERANCE - The allowable variations in measurements within which an item is judged acceptable.

TRANSISTANCE - An electronic characteristic exhibited in the form of voltage or current gain or in the ability to control voltages or currents in a precise and nonlinear manner. (Examples of parts showing transistance: Transistors, diodes, vacuum tubes.)

UNDERCUT - The reduction of the cross section of a metal-foil conductor caused by the etchant's removal of metal from beneath the edge of the resist.

WAFER - Use **SUBSTRATE**.

WARMUP TIME - Time measured from the application of power to an operable system to the instant when the system is capable of functioning in its intended manner.

WELDED CIRCUIT - A circuit made up of electronic parts which have their leads interconnected by welding techniques.

WIRING PATTERN - Use CONDUCTIVE PATTERN.